Adm - 13, 3

MEMORANDUM FOR: Chief, Physics-Chemistry Division/ORD

SUBJECT: Comments on Environmental Studies

Attached are [redacted] comments on the subject studies and also some names of US experts in related fields as you requested. STAT STAT

[redacted]

Chief
Physical Sciences and
Engineering Division/SI

Attachment: a/s

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STAT OSI/PSED/PSB [redacted] (1 Sep 72)

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ATTACHMENT

Comments on Dr. Browning's Studies, ORD 3377-72 and 4065-72

The proposition, expounded by Dr. Browning, that tidal forces may trigger large earthquakes and associated phenomena such as volcanoes is interesting. Presuming that his statistical analysis of large earthquake occurrences is correct, it would be hard to deny that there appears to be some causal effect between tidal forces and very large earthquakes. The discovery that moonquakes are associated with tidal forces also tends to strengthen this conclusion. Furthermore, it seems logical that these forces easily could cause a sudden energy release in an area where the stress has built up to a large value.

On the negative side, some of the earthquake data used by Dr. Browning may be somewhat questionable. His data for the 20th century are based on earthquakes having magnitudes greater than 8 on the Richter scale. This is a legitimate way to proceed, but it provided him with only 8 data points and this is too small a sample to confidently establish any periodicities. The remainder of the earthquake data used apparently was based on number of deaths caused by the quake (the Richter scale was not devised until this century). This would introduce a bias into the data because the number of deaths obviously is dependent on the population density of the area where the earthquake occurs, as well as on the depth at which it occurs. As an example, the two greatest earthquakes in history in this country were in Missouri and South Carolina but these are not nearly so famous as the lesser magnitude San Francisco earthquake which caused more deaths because of the higher population density.

The other section of the report in which Dr. Browning forecasts a severe drought at the end of this decade is based to a certain extent on the first analysis. Since earthquakes

and volcanoes are related, it can be stated that volcanic eruptions often occur in the same time frame as earthquakes. When major volcanic eruptions occur, enough dust is deposited in the stratosphere to cause a drop in average temperature of the earth. According to his analysis a peak in the curve of tidal variations (based on sun-earth-moon positions) is approaching. Dr. Browning uses this as one input to his forecast of a severe drought for the latter part of this decade. A second input into the forecast is based upon a periodicity related to the sunspot cycle--according to his analysis, a dry period in this cycle also is approaching. Finally, from a paleoclimatological aspect, Dr. Browning has found that we may be approaching the drought portion of this very long period cycle. Since we are approaching a dry cycle in all of the aspects considered, Dr. Browning believes that we may be faced with a catastrophic period characterized by severe drought and famine.

That volcanoes can have an effect on the earth's weather and climate (particularly temperature) is fairly well accepted; the magnitude of the effect has not been established, however. The other two inputs used by Dr. Browning are undoubtedly less well established and more controversial; nevertheless, the cyclical nature of weather and climate cannot be disputed. The cycles established by Dr. Browning in his analysis could be checked out by an independent statistical analysis, but this office has neither the access to the necessary data nor the professional manpower required to carry it out. Should ORD choose to sponsor an independent analysis, we would recommend STAT